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ABSTRACT

Preschool children's association of the correct name with a clearly identified graphic form during an alphabet naming process is examined in this study. Subjects were 139 children (ages 2, 3, 4, and 5 years) who were asked individually to identify 52 cards, each with a single upper or lower case letter printed on it. Analysis of data was based on the absolute number of correct responses and the type of error for each age group. Errors were categorized as conceptual errors (random number and word naming), association errors (random letter naming), and feature errors. Results indicate that there is a developmental sequence in learning upper and lower case letters of the alphabet. Children of all ages experience greater difficulty learning to identify lower case letters. Types of errors made serve as an indication of cognitive and discriminatory processes the child is employing. Examination of these error patterns reveals that children move from making conceptual cognitive errors to making perceptual discrimination errors. (Author/JA)

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Alphabet Identification by Two to Five Year Olds

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ABSTRACT

Analysis of errors made by two, three, four and five year olds in an upper and lower letter identification task reveal the existence of developmental stages and differing error patterns within these stages. Differences in the number and types of errors in upper and lower case identification indicate that young children experience greater difficulty learning to identify lower case letters. Types of errors made serve as an indication of cognitive and discriminatory processes the child is employing. Examiniation of these patterns reveals that children move from making concept cognitive errors to making perceptual discrimination errors.

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ALPHABET IDENTIFICATION BY TWO TO FIVE YEAR OLDS

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ALPHABET IDENTIFICATION BY 2 to 5 YEAR OLDS

Learning the alphabet is the young child's first encounter with academic tasks. If this first task is successfully accomplished before the learner enters school, success can be predicted for the next academic task the learner will face - beginning reading. Alphabet learning is important to success for the learner (Bond and Dykstra, 1967), yet little is known about how the young child learns the alphabet, how figures are discriminated, and names learned and attached to each figure.

Guralnick (1972) describes letter naming as a two step process. Step I, discrimination, involves the discrimination and differentiation of the graphic form. Step 2, association, is dependent upon the association between letter name and a clearly and correctly identified graphic form. Confusions occurring within the discrimination phase can cause further confusions when the learner attempts to attach a verbal label in the association stage to a poorly differentiated figure.

Step I in the letter identification process begins as the young child learns to discriminate between writing and nonwriting. Development of this ability has been observed by examining childrens' own print production (Hildreth, 1936) and their ability to discriminate between writing and nonwriting (Lavine, 1977). Pictoriality, linearity, multiplicity of units and variety of units have been isolated as features which 3, 4, 5 year olds use to differentiate writing from nonwriting. As the learner matures, he places an increasing emphasis on features of the individual unit within the sample rather than on the features of the writing sample as a whole. Attention is focussed increasingly on individual letters and their features.

Gibson (1967) analyzed capital letters to determine features common to them all and charted the distinctive features of each letter and features each

shared in common with other letters. Thorson (1976) using a Posner-type matching task, found that the more features, as defined by Gibson, two capital letters had in common the more difficult it was to differentiate between them. Features used in identifying capital letters include curve vs. straight lines, roundness, squareness, linearity, perspective, rotation, reversal, and break-close. Some discriminations are more easily learned than others. Preschool learners have little difficulty with break-close features, but do not appear to master line-curve and rotation-reversal features until at least 6 years of age and perspective transformation features until after 8 years of age (Gibson, 1965).

Dunn-Rankin (1968A) analyzed lower case letters to determine their similarities. Six clearly definable clusters of letters having high within group confusability were revealed. In a further study (Dunn-Rankin, 1968B) he examined letter pairs to determine the largest common area that each letter shared with every other letter. Common area space was defined as that space which two letters share when superimposed and axially rotated. Five letter groupings and critical features for analysis within those groups were established. Features important for lower case letter indentification include short open vs. closed curves, closed curves vs. straight line, open curve vs. straight line, extended curve vs. shart straight line and line slant. Errors in identification of similarity due to rotation of the figure in space was found to occur frequently within these feature groups and rarely, or never, between groups (Popp, 1964; Dunn-Rankin, 1968A, 1968B).

Feature analysis studies like these provided information about the sources of perceptual errors which might occur during Step 1 of the letter naming process. Incorrect letter identification at this step is due to inadequate discrimination or differentiation of the graphic form. Confusions in this initial discrimination phase may cause severe problems when the

learner attempts to attach a verbal label to the perceived figure, Step II in the letter naming process.

Step II , association of the correct name with a clearly identified graphic form, has been examined by the use of alphabet naming tasks. Errors in naming can be divided into two types, errors which indicate an insufficient use of feature information or within group feature confusion in the discrimination process (Bouma, 1971) and errors which indicate cognitive processes involved in production of the label name and its attachment to the figure (Watt and Jacobs, 1975). Analysis of errors made by adults naming figures seen in eccentric (peripheral) vision and at a long distance show confusion due to errors in perception and incorrect use of featural information (Bouma, 1971).

Although a great deal is known about Step I in the alphabet identification process and some work has been done with adults in Step II, surprisingly little is known about what young children do in the association phase of the alphabet naming process. This study is concerned with how preschool children perform during Step II: What type of errors do young children make, featural or conceptual? Is there a developmental sequence in the type of errors they make? In their concepts about the alphabet? How do young children naturally master their first academic task, learning the alphabet?

METHOD

Subjects. The subjects were 139 preschool children from three cities in central California. Twenty-one two year olds (mean age 30.8 months), 41 three year olds (mean age 42.2 months), 41 four year olds (mean age 53.6 months) and 36 five year olds (mean age 62.8 months) took part in the study. Children came from a wide variety of ethnic and socioeconomic backgrounds. They all attended preschools in which their names and labels on articles within

the classrooms were printed using both upper and lower case letters. Some discussion and instruction of both upper and lower case letters had occurred at all preschools. However, none of the children had received systematic instruction of the alphabet at school.

Procedure. Subjects were individually shown 52 cards, each with a single upper or lower case letter printed on it. Children were asked, "What is the name of this? What do we call this?" Letters were presented in random order within each case. Order of case presentation was randomized across all subjects. All responses were recorded.

Materials. The materials consisted of a set of 52 plastic coated cards measuring 4 inches by 4 inches. Each card had one letter printed on it in black ink. Full space letters (capitals, lower case b, l, f, etc.) were two inches in heighth. Half space letters (a, c, z, etc) measured one inch in heighth. The print style used was that taught to children in the first grade when they begin to receive formal instruction on letter production (Noble, 1967).

RESULTS

Analysis of the data was based upon two types of information, absolute number of correct responses and type of error. Correct responses for both upper and lower case letters were tabulated for each age level. A 4 X 2 analysis of variance revealed a significant main effect of age and also of case. As was expected, children at each age level were able to identify significantly more letters than children of preceeding age levels ($F=11.48$, $df=3, 126$, $p < .001$). The mean number of correct letters for two, three,

four and five year olds was 2.9, 6.6, 12.5 and 15.5 respectively. Learners of all ages were able to identify significantly more upper case than lower case letters ($F=10.6$, df-3, 126, $p < .001$). Subjects averaged 11.7 correct responses for upper and 9.0 correct responses for lower case letters. There was no significant interaction between these factors.

Error responses were categorized as being of one of two types: 1) failure to identify a graphic form due to the incorrect choice of a name and 2) failure to identify a graphic form due to faulty discrimination of letter features. Errors due to the failure to choose the correct name for a graphic form included the following: 1) random word naming, 2) random number naming, and 3) random letter naming. The second type of error category, discrimination errors, were those which were 1) from the same feature group or 2) rotation or reversals involving letters from the same feature group. Feature group distinctions for upper case letters were determined by use of Gibson's (1967) shared feature chart. Dunn-Rankin's (1968A, 1968B) and Bouma's (1971) lower case feature groups were consolidated to establish a shared feature chart for lower case letters. Errors were analyzed and tabulated for each of the four age levels and for both upper and lower case types.

For error type a 4 X 2 X 2 analysis of variance revealed a significant main effect of case ($F=18.33$, df=1, 3, $p < .001$). Since the number of errors is the inverse of the number correct, this finding parallels the analysis on correct responses. Children tended to make more lower case errors (mean 5.4) than upper case (mean 4.3).

There was also a significant main effect for age ($F=14.44$, df=3, 123, $p < .001$) as well as type of error ($F=88.29$, df=1, 3, $p < .001$). However, there was a significant interaction between these two factors ($F=20.55$, df=3, 123, $p < .001$). As displayed in Figure 1, number of incorrect name choice errors decreased dramatically as age increased. Featural errors increased from two to four years of age where they reached their maximum number of occurrances.

DISCUSSION

Results of this study indicate that these preschool children are learning to identify the upper case before the lower case alphabet. This is occurring despite the fact that the children are dealing every day with both upper and lower case print in the school environment. The delay in learning lower case letters may be due to the large number of possible letter rotations within the printed alphabet relative to those in upper case. An examination of featural errors across all ages reveal that while only 8% of the upper case errors are due to reversals, 45% of the lower case featural erros were due to this factor. Pilot work on a cluster analysis of letter name response errors by age now being performed, seems to indicate only two types of rotation confusions are made by preschool learners within the upper case, N-Z and M-W, but at least eight confusions are made within the lower case. Lower case rotation errors can be further broken down into three types: rotation around the axis, i.e., b-q, p-d, x-t, m-w, reversal of the letter form, i.e., d-b and p-q, and both rotation and reversal changes, i.e., d-q and p-b. Preschool learners exhibit considerable confusion about the importance of the lower case grapheme's stability in space. The fact that a grapheme cannot be rotated in space and remain the same grapheme does not appear to be clearly understood, even by five year olds. As many of the letters frequently used in beginning reading words fall into these lower case rotational groups, the need to help children focus on the position of the letter and its distinguishing features is evident.

Error analysis results reveal that two and three year olds make a significantly ($p. < .01$) greater number of naming errors than feature errors. They frequently give the graphemes word names or call them by number or random letter names. At this early age, they very rarely make any featural errors.

Differences between number of naming and featural errors was not significant at either ages four or five. As can be seen from Figure 1, the number of featural errors learners make increases from age two to three and peaks at age four. Feature group errors are due to confusions of differentiation among letters of the same feature group. This suggests that although four year olds make use of distinctive features which separate major feature groups from each other, they are unable to use the fine distinctions which would allow them to differentiate between letters within a feature group.

One interesting trend noticed in the data was that for subjects between four and five years of age, the number of upper case feature group errors decreased. However, the number of feature groups errors made in lower case identification remained constant. One possible explanation for this is that the learner is beginning to use the finer distinctions which are needed for differentiation between upper case letters occurring in the same feature group, but is unable to make the same fine feature differentiations with lower case letters. Results of the first analysis suggest that stability in space may be the distinctive feature in the lower case which four and five year olds have not yet mastered.

Discussion concerning what was thought to be a large number of naming errors on the part of four year olds (mean 4.34 upper case, 5.24 lower case) led to a re-examination of error type 1, incorrect number naming and random letter responses. Responding with either a single word or a number name indicates a conceptual confusion between whole words, numbers and print figures (Watt and Jacobs, 1971). Random letter naming, however, does not show a confusion in concepts, but rather a confusion in matching name to grapheme. This may be an indication that the child is beginning to learn the names for the graphemes but does not, as yet, realize that specific names go with specific figures. Errors of this type reveal a growth in concept understanding and are

qualitatively different from word and random number naming. Analysis of random letter responses reveal many responses in which the subject called all of the letters by one single name, responses in which four or five names were randomly applied to all graphemes and responses in which a large number of names were randomly applied across all graphemes.

The question was raised concerning what the error pattern would look like if random letter naming were considered as an error type by itself. Figure 2 shows the error pattern when the data were analyzed using three error groups: naming errors, random letter naming errors and featural errors. This pattern of results seems to indicate that four and five year olds display a considerable drop in their naming errors but still struggle with both featural and random letter errors. It is quite plausible that an additional group of six year old subjects might continue this trend with naming errors almost non-existent, random letters continuing their decline leaving featural errors the last error type to be overcome.

This look at how preschool children identify the upper and lower case graphemes and the types of errors they make has provided some answers about how children learn the alphabet. There appears to be a developmental sequence in learning upper and lower case alphabet. Upper case letters are learned before lower case letters. It has been suggested that this delay in learning to identify lower case graphemes may be due to greater number and type of reversal errors which are found in the lower case and which do, in fact, give children a considerable amount of trouble. Stability in space has been suggested as the important distinguishing feature which is so difficult for preschool children to learn to focus on. The number of lower case rotational errors at five years of age suggest that instruction in kindergarden and first grade should involve helping the child to correctly

discriminate between the spatially unstable lower case graphemes.

Young children make three types of errors: conceptual errors (random number and word naming), association errors (random letter naming) and feature errors. No clear developmental sequence in error type was observed. Failure to find significant differences in error patterns was largely due to the wide variance in performance levels within each age group.

A clearly defined developmental trend in young learner's concepts about the alphabet was observed. Two and three year olds made significantly more concept related error responses than four and five year olds. Young children appear to develop an understanding of alphabet naming out of words naming things and number names. Initially, graphemes are named, i.e., mail, doggies, smooching, cookie, kitty cats, etc. Gradually, the young child realizes that the graphemes are not words and gives them number names: "fif-twenty", forty-forty, etc. Many children responded by correctly counting in order, the first stimulus presented being named one, the second stimulus two, etc. until they reached the end of their count string and they they began again. Other children used idiosyncratic counting lists, i.e., 1, 2, 3, 6, 10, 11, 15, or idiosyncratic number names, i.e., two-six, "fiftwenty", fortyforty. These idiosyncratic counts often included letter names, i.e., 1, 2, 3, 4, 5, 6, 7, M, B, H. Gradually, the amount of number naming decreases. Very few naming errors at age 5 involve giving letters word names. The only errors involve the letters x or t which are named cross. Number naming errors are not random. All errors involve either the lower case letters i and l and the capital I which are called one or the lower case letters p and q which are called 9.

As number naming decreases, random letter naming increases. As children learn the distinctive features of letters and focus on those features, letter

naming errors fall into feature groups.

Four years of age appears to be a critical age in the learning to use distinctive features. It is at that age that learners indentifying upper case graphemes appear to get a good grasp of distinctive between group indentification features and begin to differentiate using the finer within group features. Between three and four years of age, the learner appears to develop clear concepts of words, numbers and letters, so that, by age four, few random number and word naming errors are made. Developing conceptual understanding of the alphabet is clearly visible.

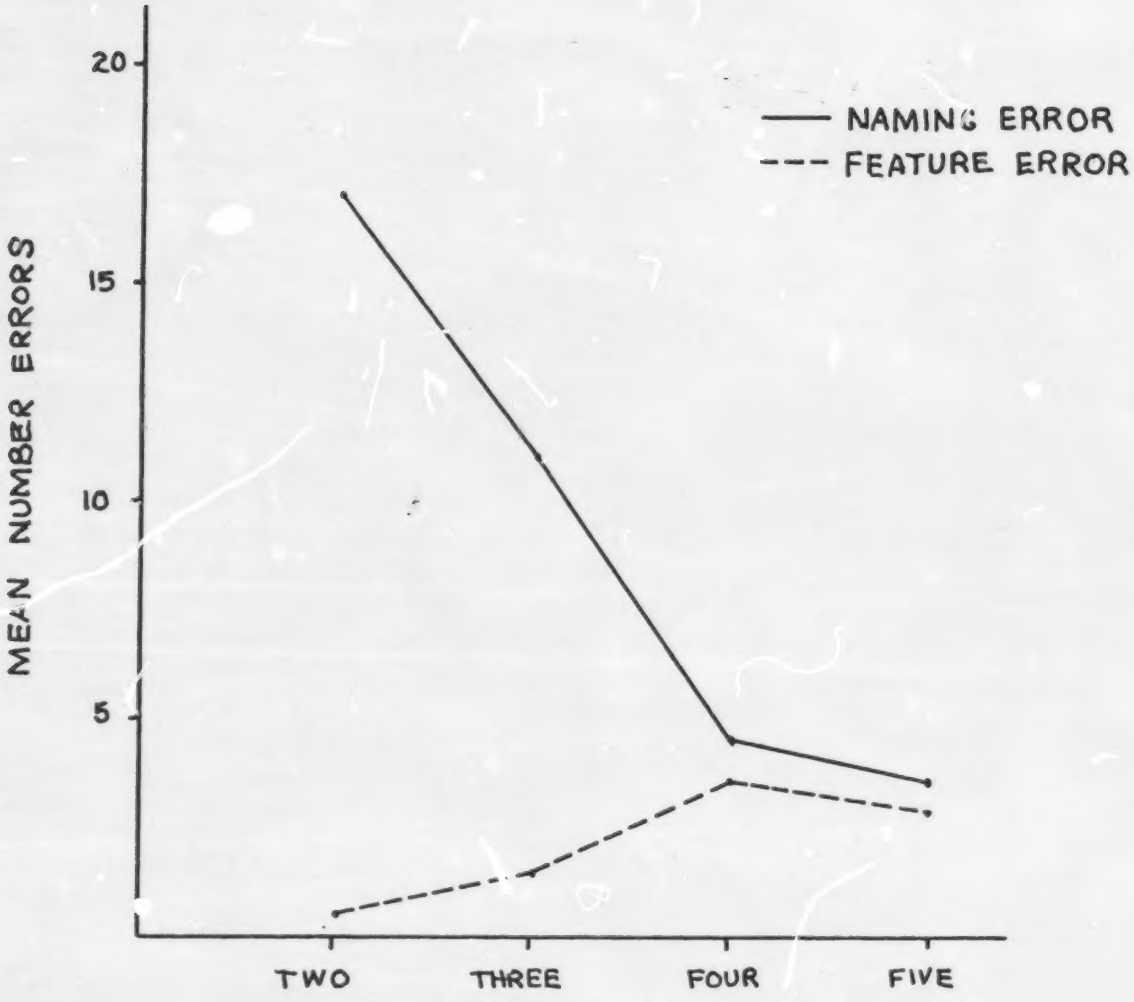
20
15
10
5
MEAN NUMBER ERRORS
NAMING ERROR
FEATURE ERROR
TWO
THREE
FOUR
FIVE
AGE

FIGURE 1

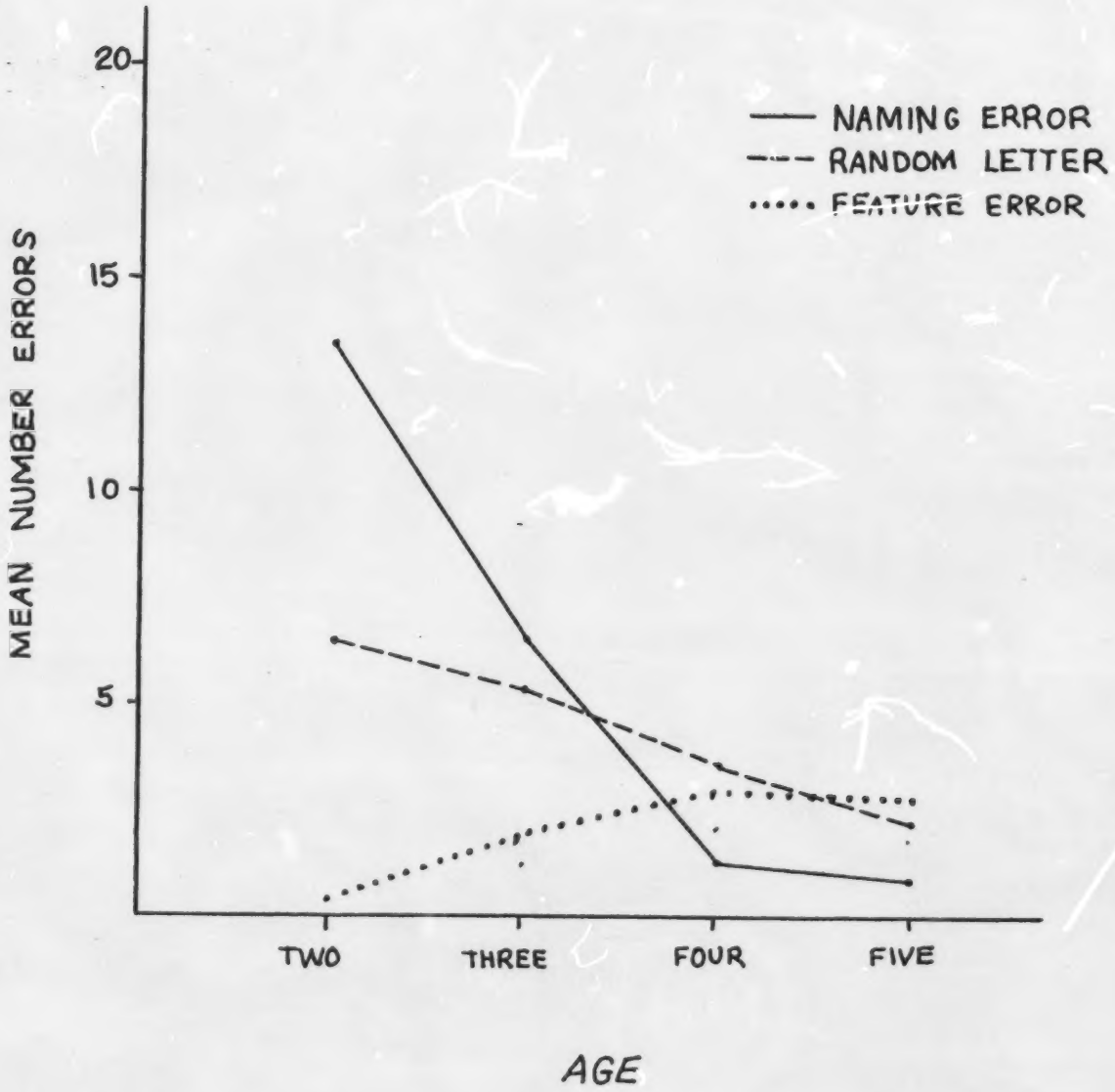
20
15
10
5
MEAN NUMBER ERRORS
NAMING ERROR
RANDOM LETTER
FEATURE ERROR
TWO
THREE
FOUR
FIVE
AGE

FIGURE 2

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